June 2, 1970 E. T. TURNEY, JR 3,514,803

APPARATUS TO SELECTIVELY REMOVE POWDER FROM COATED SHEET MATERIAL

Filed June 5, 1967 3 Sheets-Sheet 1

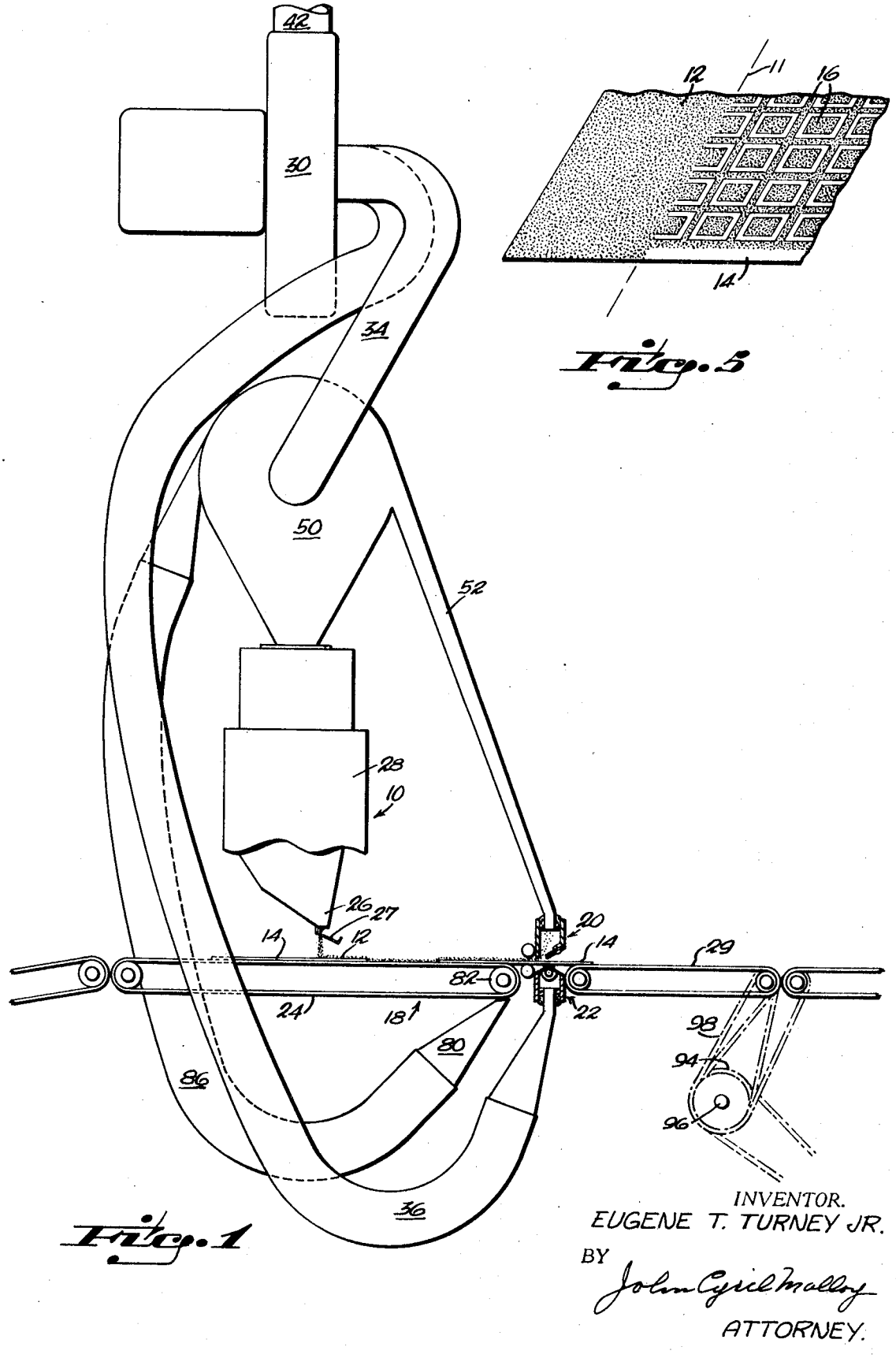


Fig. 1

Fig. 5

INVENTOR.
EUGENE T. TURNEY JR.
BY
John Cyril Malloy
ATTORNEY.

June 2, 1970 E. T. TURNEY, JR 3,514,803

APPARATUS TO SELECTIVELY REMOVE POWDER FROM COATED SHEET MATERIAL

Filed June 5, 1967 3 Sheets-Sheet 2

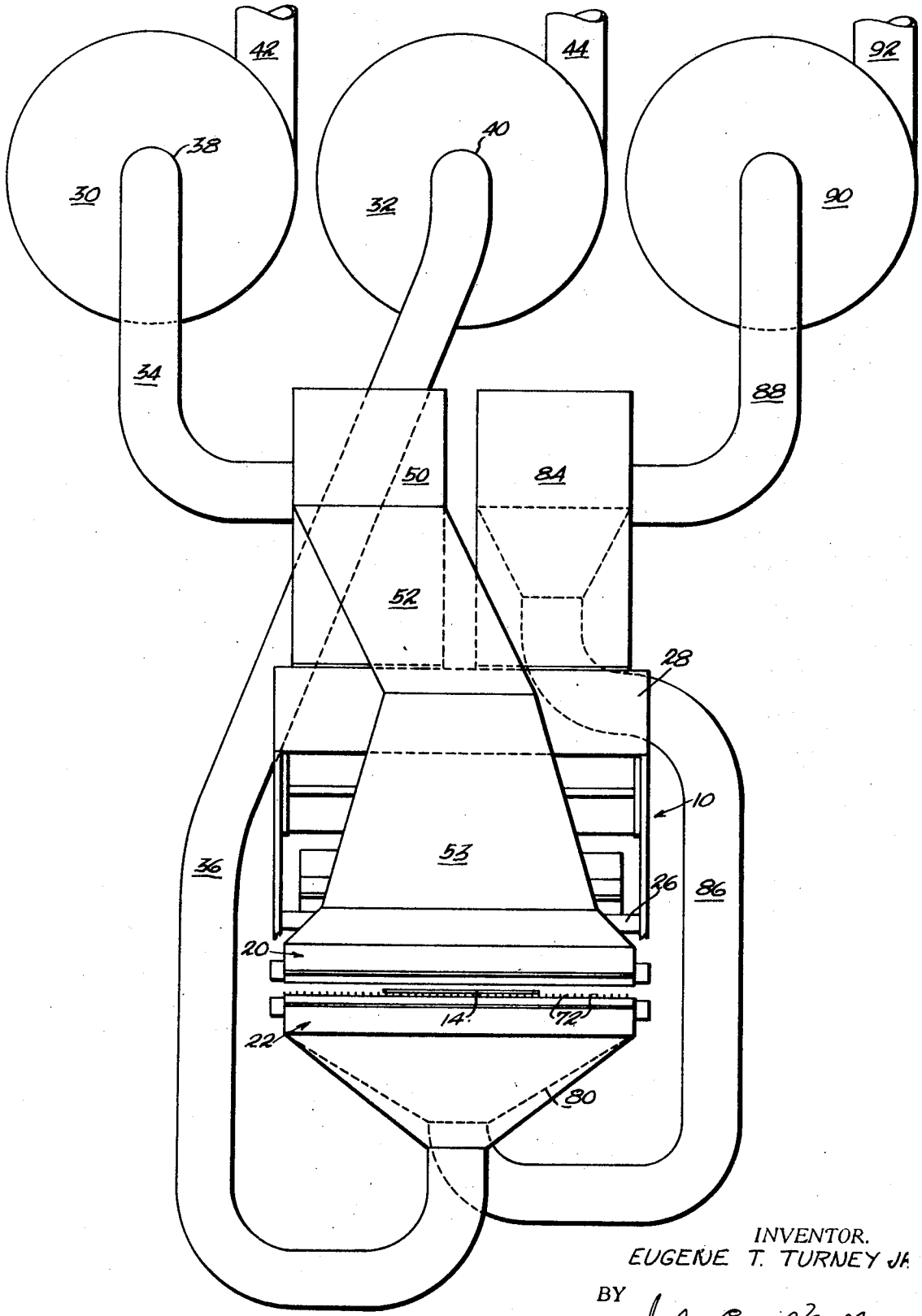


Fig. 2

INVENTOR.
EUGENE T. TURNEY JR

BY John Cyril Malloy

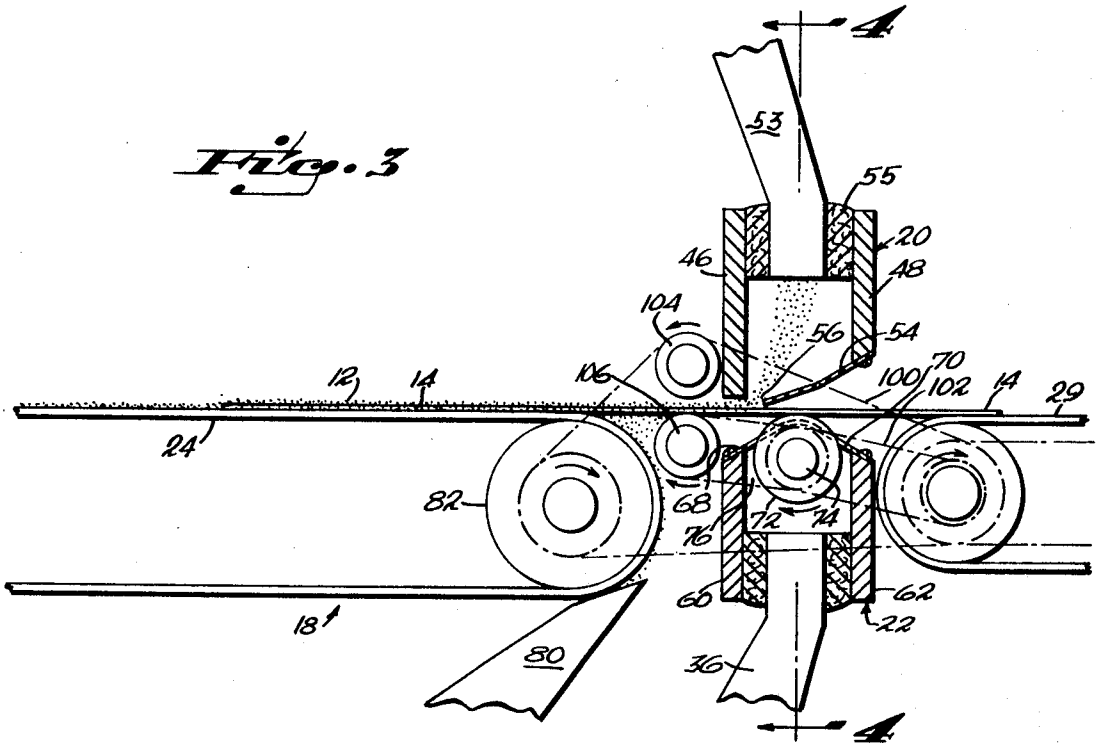
ATTORNEY.

June 2, 1970 E. T. TURNEY, JR 3,514,803

APPARATUS TO SELECTIVELY REMOVE POWDER FROM COATED SHEET MATERIAL

Filed June 5, 1967 3 Sheets-Sheet 3

Fig. 3



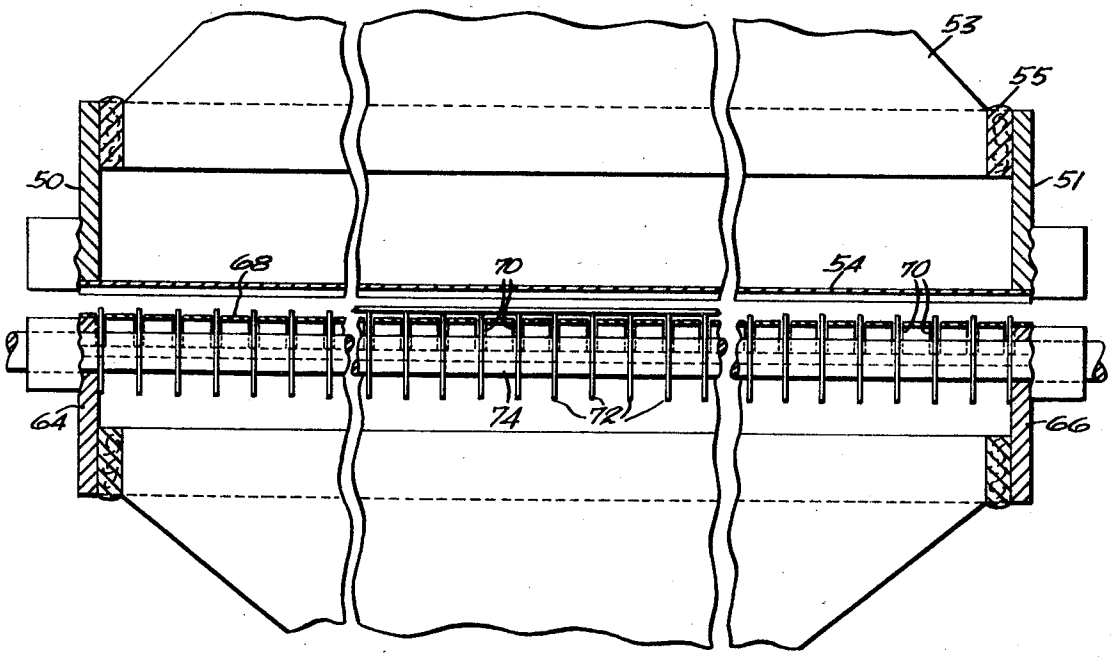


Fig. 4

INVENTOR.
EUGENE T. TURNEY JR.
BY
John Cyril Malloy
ATTORNEY.

United States Patent Office 3,514,803 Patented June 2, 1970

3,514,803

APPARATUS TO SELECTIVELY REMOVE POWDER FROM COATED SHEET MATERIAL

Eugene T. Turney, Jr., 1112 S. North Lake Drive, Hollywood, Fla. 33021

Filed June 5, 1967, Ser. No. 643,615
Int. Cl. A47l 5/00
U.S. Cl. 15—306 7 Claims

ABSTRACT OF THE DISCLOSURE

Apparatus for and process of removing excess powder from the face surfaces of sheets which have been treated by selectively coating certain face areas with a material to hold a film of powder thereon; the sheets having a layer of powder thereover are moved in a plane of travel between opposed elongate vacuum nozzles, one of the nozzles providing a vacuum force to lift free powder from the powdered face surfaces of the sheets to remove the excess, and the other and opposed nozzle providing a vacuum force of balance on the underside or unpowdered surface of the sheet to resist lifting of the sheet and maintain the sheets in their plane of travel.

This invention pertains to an apparatus for removing excess powder from coated and uncoated surface areas of sheets, and, more particularly, to an apparatus to be used in combination with a device which continuously deposits a uniform fall of powder on sheets having surface areas coated with a material to hold a film of powder on said surface areas.

In the past, various types of thin signs, nameplates, etc. have been made by a process which includes selectively coating certain areas. The step of coating with powder has been one which presents no major problem; however, a problem has been encountered in cleaning the excess powder from the coated and uncoated areas. In general practice, this is accomplished by exposing the powdered surfaces to vacuum forces on the powdered side only, i.e., on one side of the thin coated material, which, of course, necessitated some means for holding the sheet down so as not to be drawn up to pass in scraping engagement against the vacuum nozzle, in which event the powder coated designs would be marred or destroyed. In the past, the means to hold the sheet down included the provision of a shaft extending transversely across the mouth of the vacuum nozzle with a rotating series of relatively thin, spaced discs having knifelike annular edges to contact the powdered surfaces of the sheets to hold them in the proper spaced relation below the vacuum nozzle. This structure has been somewhat objectionable because a series of thin, spaced parallel lines results which is often visible across the powder coated areas particularly when viewed in certain lights and at certain angles, and, consequently, there has been a distinct design limitation in the manufacture of the nameplates by this process.

It is, therefore, a principal object of the instant invention to provide a structure for producing this type of sign, plaque, nameplate, etc. which eliminates all need for structural contact with the powdered surface areas thereof, before, during, or after removal of the excess powder therefrom.

It is a further object of this invention to apply a first vacuum force of lift to the powdered surfaces of the sheets to remove the excess powder and which tends to lift the sheet; and a countervailing second vacuum force to the opposite sheet side or back, which is unpowdered to balance against the lift force on the sheets so that the same tend to float past the powder removal station without material deviation from their plane of travel.

Yet another object of the instant invention is to provide a transverse support shaft in the mouth of the countervailing force-causing nozzle, which nozzle exerts a vacuum force on the back or unpowdered side of the sheets, which shaft is provided with relatively thin, spaced discs to contact the back surface areas of the sheets and support the unpowdered surface as required. The vacuum forces utilized are such that the sheets passing between the two vacuum nozzles are maintained in their plane of travel and may have contact with the discs on their back or unpowdered sides only.

A still further object of this invention is to provide blower units having their intake sides in communication with the vacuum nozzles to provide vacuum forces thereto.

In accordance with these and other objects which will become apparent hereinafter, the instant invention will now be described with reference to the accompanying drawings in which:

FIG. 1 is a schematic side view of the apparatus of the instant invention and illustrating the powder removal station;

FIG. 2 is a schematic end elevation thereof as viewed from a point between the input and output conveyors;

FIG. 3 is an enlarged detailed view of that portion of FIG. 1 illustrating the upper and lower elongate vacuum nozzles of the powder removal station;

FIG. 4 is a transverse vertical sectional view of the powder removal station taken along the line 4—4 of FIG. 3 and looking in the direction of the arrows; and

FIG. 5 is a fragmentary perspective view of a decorative design in accordance with the instant invention after the powder has been applied and with the excess powder removed from a portion thereof.

Before referring to the drawings in detail, a preliminary reference to FIG. 5 will be helpful. The sheet **14**, it will be noted, is coated with a uniform layer or fall of powder **12** to the left of the dotted line **11** which represents the powder removal station to be discussed hereinafter. The powder adheres to those areas **16** to which an adhesive has been selectively applied and rides freely on the areas **14** which have not been selectively coated. The powder is to be removed from the uncoated areas **14** in the powder removal station. Referring to the drawings of the powder removal station, like reference characters designate like or corresponding parts throughout the different views; the instant invention includes generally a powder hopper and discharge nozzle **10** for depositing a uniform fall of powder **12** on the upper face of the sheet **14** which has been selectively coated with the adhesive. A conveyor system **18** is provided to transport the sheets **14** downstream from a powder application station which includes the powder discharge nozzle **10** to the powder removal station, which includes a pair of opposed elongate vacuum nozzles **20** and **22** which extend transversely of the line of travel of the conveyor **18** on opposite sides of the plane of passage of the sheets **14**.

In more detail, the sheets **14** may have any desired design, name, etc. applied by so coating one face surface thereof with a material to hold the powder thereto. The sheets are then placed or fed onto an infeed portion **24** of the conveyor with the coated side up and transported beneath the powder discharge nozzle **26**, disposed transversely of the infeed conveyor **24**. A continuous uniform fall of powder is provided from the powder nozzle to the top surfaces of the sheets. A powder supply hopper **28** is in communication with the nozzle to provide a continuous supply thereto and a screen **27** is preferably pro-

vided below the mouth of the nozzle to facilitate distribution of the powder **12**.

The sheets continue downstream to pass between the transverse elongate vacuum nozzles **20** and **22** which are positioned between the input conveyor portion **24** and the discharge conveyor portion **29**. Elongate nozzle **20** is positioned above and adjacent the plane of the top surfaces of the sheets **14** and the nozzle **22** is positioned below and adjacent the plane of the bottom surfaces of the sheets to permit the sheets to pass freely therebetween, FIGS. 1 and 2. Vacuum forces are applied to both nozzles by means of blowers **30** and **32** in communication with the nozzles **20** and **22** through conduits **34** and **36** respectively, the conduits connecting the nozzles to the intakes of the blowers as at **38** and **40**. This discharge conduits **42** and **44** of the blowers are preferably vented to the atmosphere.

The upper or lift vacuum nozzle **20** which removes the excess powder from the treated surface having the coated and uncoated areas of the sheets is in open communication with a powder reclaim chamber **50** by means of a conduit and hood **52** and **53** respectively, connecting with the transverse nozzle **20**. Conduit **34** communicates between the reclaim chamber and the intake **38** of blower unit **30**.

The upper or lift vaccum nozzle **20** is composed of transverse side walls **46** and **48**, end walls **50** and **51** and a partial floor **54** preferably angled upwardly from and sized to form the vacuum mouth **56**. An appropriate packing **55** is preferably included between the mouth of the hood **53** and the nozzle walls.

The lower or balancing vacuum nozzle **22** which supplies the countervailing force together with weight of the sheet is composed of transverse side walls **60** and **62**, end walls **64** and **66** and a generally inverted V roof **68**, FIG. 3. A series of spaced, parallel slots **70** are provided across the width of the roof to provide for the vacuum forces on the bottom face surfaces of the sheets and for passage of a series of spaced discs **72** carried by a transverse shaft **74** extending across and through the mouth area **76** of the nozzle **22**. The peripheries of the discs, as best illustrated in FIGS. 3 and 4, extend upwardly through the slots **70** to the plane of the bottom surfaces of the sheets **14**. Thus, insofar as the sheets are not balanced by the opposing vertical forces acting thereon, the only contact with the sheets as they pass between the transverse vacuum nozzles is that of the knife-thin edges of the discs to apply support forces by rolling over the untreated undersides thereof.

A third transverse elongate vacuum nozzle **80** may be provided to remove the powder from the conveyor belt, FIGS. 1 and 3. It is preferably positioned on the underside of the infeed portion **24** of the conveyor adjacent the drive roller **82**. The vacuum nozzle **80** communicates with a reclaim chamber **84** by means of a conduit **86**, and a conduit **88** connects the reclaim chamber to the intake of a blower unit **90**. An exhaust conduit **92** therefrom is exhausted to the atmosphere.

The drive as illustrated schematically in FIGS. 1 and 3 comes from a power source, not shown, to a sprocket **94** on transverse shaft **96**. The discharge portion **26** of the conveyor system is driven by a chain **98**. Referring to FIG. 3, a chain drive **100** from the driven discharge conveyor drives the roller **82** of the infeed conveyor as well as the disc shaft **54** by means of a chain **102**. A pair of driven guide rollers **104** and **106** may be utilized immediately adjacent the walls **46** and **60** of the vacuum nozzles as illustrated.

It will be apparent to those skilled in the art that the powder removal station and process disclosed herein is useful for partially removing from the treated surface of sheet material, a coating of a chemical in powder form from an area of the sheet material, without marring the surface. For instance, a powder or asphalt base dust may be employed to protectively coat an inked area, or, also, a chemical may be employed which is characterized by an affinity for metal so as to adhere thereto and hold the powder in selectively treated areas.

The process for removing the excess powder from the treated surface of sheet material includes the steps of transporting the sheet material through the powder removal station in a generally horizontal attitude, the said sheet carrying a layer of powder material which has been disposed as a fall thereover and, at the powder removal station, simultaneously, applying a sweep means to lift the excess powder from the sheet material, totally from one part and just the excess of the coating from the other part, and, balancing the lift forces caused by the sweep action by opposing force on the opposite face of the sheet material which, together with the weight of the sheet balances, is a total countervailing force to that of the lift by the sweep means so that the sheet material is not marred or sucked into marring engagement with the apparatus of the station on passage therethrough.

While there is shown and described what at present is considered a preferred embodiment of the instant invention, it will be obvious to those skilled in the art that various modifications may be made therein without departing from the true scope of the invention as defined by the appended claims.

What is claimed is:

1. A powder removal station which comprises:

(A) apparatus for removing excess powder from a treated face of sheet material selectively coated with an adhesive and carrying a uniform layer of powder on the treated face;

(B) conveyor means including guide portions to transport the sheet material in a plane of passage through the apparatus and maintaining it in a substantially planar attitude; and

(C) the improvement which resides in opposed sweep and balance means at said station to act on sheet material transported past said station, simultaneously,

(1) to sweep the excess powder of said layer from the treated face of the sheet material, and

(2) to balance the sheet material in passing through the apparatus free and clear of marring engagement of the treated surface with said apparatus,

(3) said lift and balance means comprising:

(a) a sweep nozzle means supported in the apparatus transversely of and just above the plane of passage to apply lift forces to the treated surface to lift the excess powder therefrom,

(b) a balance nozzle means to apply a countervailing force to sheet material in the plane of passage at said station, said balance nozzle means being supported by the apparatus beneath said sweep nozzle means and on the other side of the plane of passage, and

(c) blower means to create a vacuum on the sweep nozzle means and the balance nozzle means such that the vertical forces, in addition to the weight of the sheet material transported past the said station, are sufficient to lift the excess powder from the treated surface and, simultaneously, to hold the treated surface of the sheet out of marring engagement with the nozzle means and apparatus, and

(d) conduit means to connect the blower means and said nozzle means, wherein said balance nozzle means includes support means within the effective area of said countervailing force of said balance means supporting said sheet material at said station above said planar attitude and physically orienting said sheet relative to said sweeping nozzle means when the force com-

ponents of the weight of the sheet material and the balance nozzle means are greater than the lift forces of the sweep nozzle means.

2. The powder removal station as set forth in claim 1 wherein a powder reclaim chamber is provided in the conduit means intermediate the blower means and the sweep nozzle means to reclaim excess powder lifted from the sheet material.

3. The powder removal station as set forth in claim 1 wherein said support means comprises a shaft across the station including a plurality of spaced discs of common radius defining a support plane across the station at the plane of passage for the untreated lower surface of the sheet material, said support means being rotatable.

4. The powder removal station as set forth in claim 1 wherein a powder removal means is provided in the apparatus in close adjacent proximity to the conveyor means to remove excess powder from the conveyor and said powder removal means includes conduit means and is in parallel with said sweep nozzle means.

5. The powder removal station as set forth in claim 1 wherein a first blower means is provided for the sweep

nozzle means and a second blower means is provided for the balance nozzle means.

6. The powder removal station as set forth in claim 3 wherein said balance nozzle means includes a roof having a series of spaced slots with the circumference of said discs extending outwardly of the roof.

7. The powder removal station as set forth in claim 1 which includes means to deliver a fall of powdered material in a uniform layer over sheet material on said conveyor means.

References Cited

UNITED STATES PATENTS

1,696,171	12/1928	Libsius	118—63
1,926,306	9/1933	Pettersen	15—306
2,292,596	8/1942	Baechtold	118—63 X
2,338,499	1/1944	Faris et al.	118—312 X

ROBERT W. MITCHELL, Primary Examiner

U.S. Cl. X.R.

118—50